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# 881 Power Controller User Guide

Prepared by Educational Services  
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Digital Equipment Corporation

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April 1988

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# 1

## GENERAL INFORMATION

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### 1.1 INTRODUCTION

This *881 Power Controller User Guide* contains installation and operation information for the user and for field service personnel. It does not cover maintenance and servicing. The 881 Power Controller (Figure 1-1) is a general-purpose, three-phase power controller that controls and distributes ac power to various ac devices (power supplies, fans, etc.) packaged in an operating system.

The following describes the functions of the 881 Power Controller:

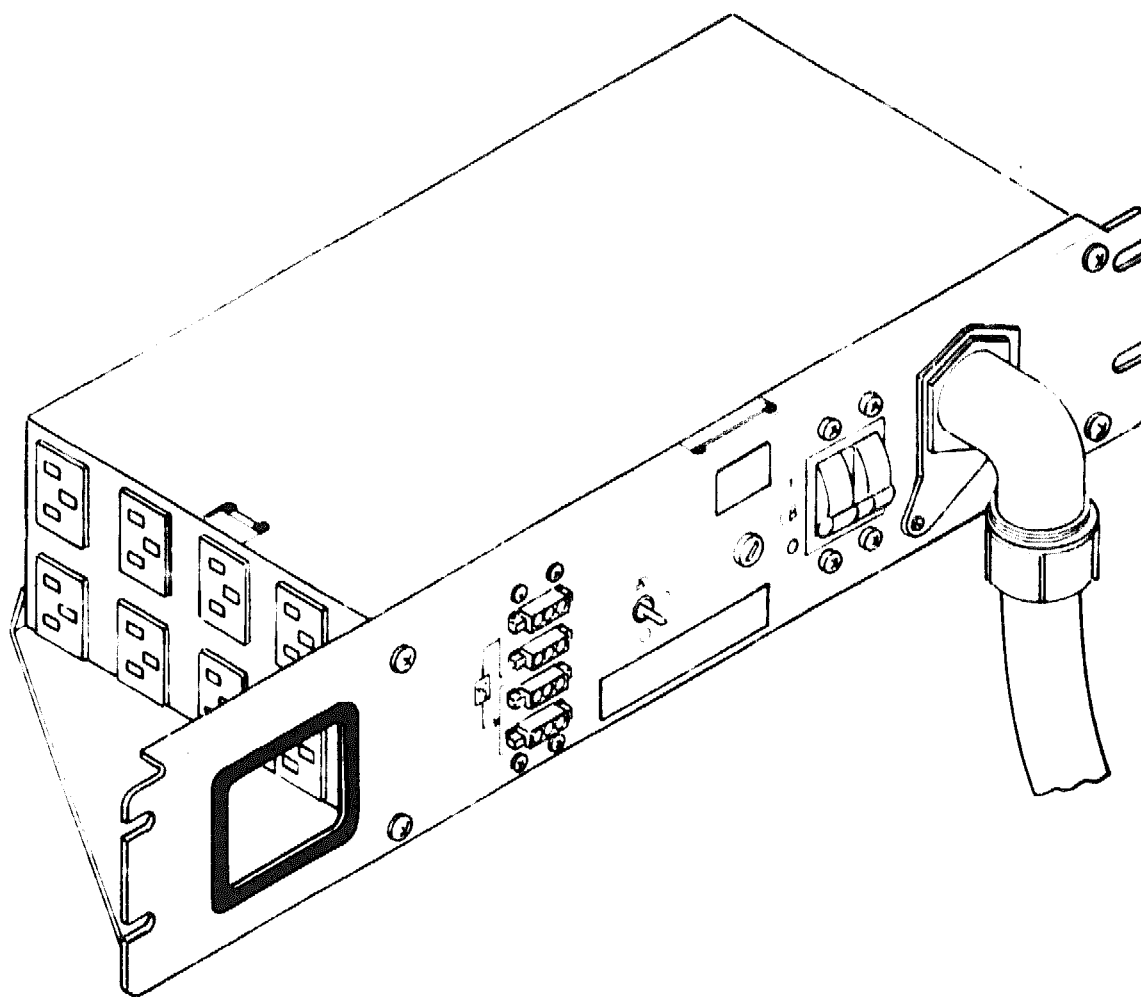
- Controls large amounts of ac power with low level signals
- Provides convenient ac power distribution to single-phase loads on a three-phase system
- Protects data equipment from electrical noise
- Disconnects ac power for servicing and in case of overload

In addition, the 881 Power Controller features are described in the following list:

- Local and remote switching
- SWITCHED receptacles only
- Convection cooling
- Rack-mounting
- AC-line filtering
- Moveable strain-relief elbow
- DIGITAL power control bus
- DIGITAL power control bus delayed output (to allow sequencing of other controllers)

### 1.2 881 POWER CONTROLLER SPECIFICATIONS

The 881 Power Controller comes in two versions (A and B) divided according to the mechanical and electrical specifications described in Table 1-1. In addition, each controller has a moveable strain-relief elbow that, by adjusting a set screw, may be mounted vertically or horizontally depending on application.



CX-600A

Figure 1-1 881 Power Controller



Table 1-1 881 Power Controller Specifications

Specifications	881A	881B
Input voltage	120/208 Vac nominal, three phase	220-240/381-416 Vac nominal, three phase
Input frequency	47-63 Hz	47-63 Hz
Total continuous phase current rating	24 A per phase	16 A per phase
Inrush current per phase	450 A peak, 1 cycle	450 A peak, 1 cycle
Power capability	2880 VA per phase	3840 VA per phase
Output receptacles	9 switched	9 switched
Output voltage	120 Vac	220-240 Vac
Receptacle current rating	15 A max per outlet	10 A max per outlet
Dimensions	3.38" high x 8.7" deep x 19" wide	3.38" high x 8.7" deep x 19" wide
Weight	18 lbs	14 lbs
Mounting	Rack-mountable (19-inch rack)	Rack-mountable (19-inch rack)
Cooling	Convection	Convection
Ambient temperature	5° to +50° C (41° to 122° F) (operating)	5° to +50° C (41° to 122° F) (operating)
Relative humidity	95 percent maximum (no condensation)	95 percent maximum (no condensation)
Altitude	Sea level to 2400 meters (8000 ft)	Sea level to 2400 meters (8000 ft)
Fusing (internal circuitry only)	.375A slow blow (250V)	.315A type T (250V)
Safety	Complies with Canadian Standards Association (CSA) standard C22.2.	Complies with Canadian Standards Association (CSA) standard C22.2.
	Recognized by Underwriters Laboratories. Incorporated R in accordance with UL 478.	Recognized by Underwriters Laboratories. Incorporated R in accordance with UL 478.
		Classified by Underwriters Laboratories. Incorporated in accordance with IEC 435 and 380.



# 2

## INSTALLATION

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### 2.1 INTRODUCTION

A certain amount of planning is necessary before installing the 881 Power Controller. Consider the items in the following paragraphs.

#### **WARNING**

**Hazardous voltages are present inside this equipment. Bodily injury or equipment damage may result from improper service. Maintenance must be performed by a qualified service representative.**

Implementation of the DIGITAL power control bus or sequenced power control bus permits normal control of the power state of computers and certain peripheral devices. It is not intended to meet the requirements of National Fire Protection Association (NFPA) No. 75-7300 Emergency Power Controls in Computer Rooms. This specification requires an Emergency Power Control Switch near the operator's panel and the room EXIT to disconnect all power to the electronic devices in the room. DIGITAL recommends that the user provide such switches and protective circuitry as part of site preparation.

#### 2.1.1 AC Power Distribution

The ac power connections on the 881 Power Controller conform to UL, CSA and IEC standards. The 881 Power Controller has nine output female receptacles (Figure 2-1). It also has one input controller power plug.

#### **WARNING**

**Do not plug line cords into any of the nine output receptacles in a reversed direction. The grounding protection is eliminated when a line cord is reversed. See Figure 2-2.**

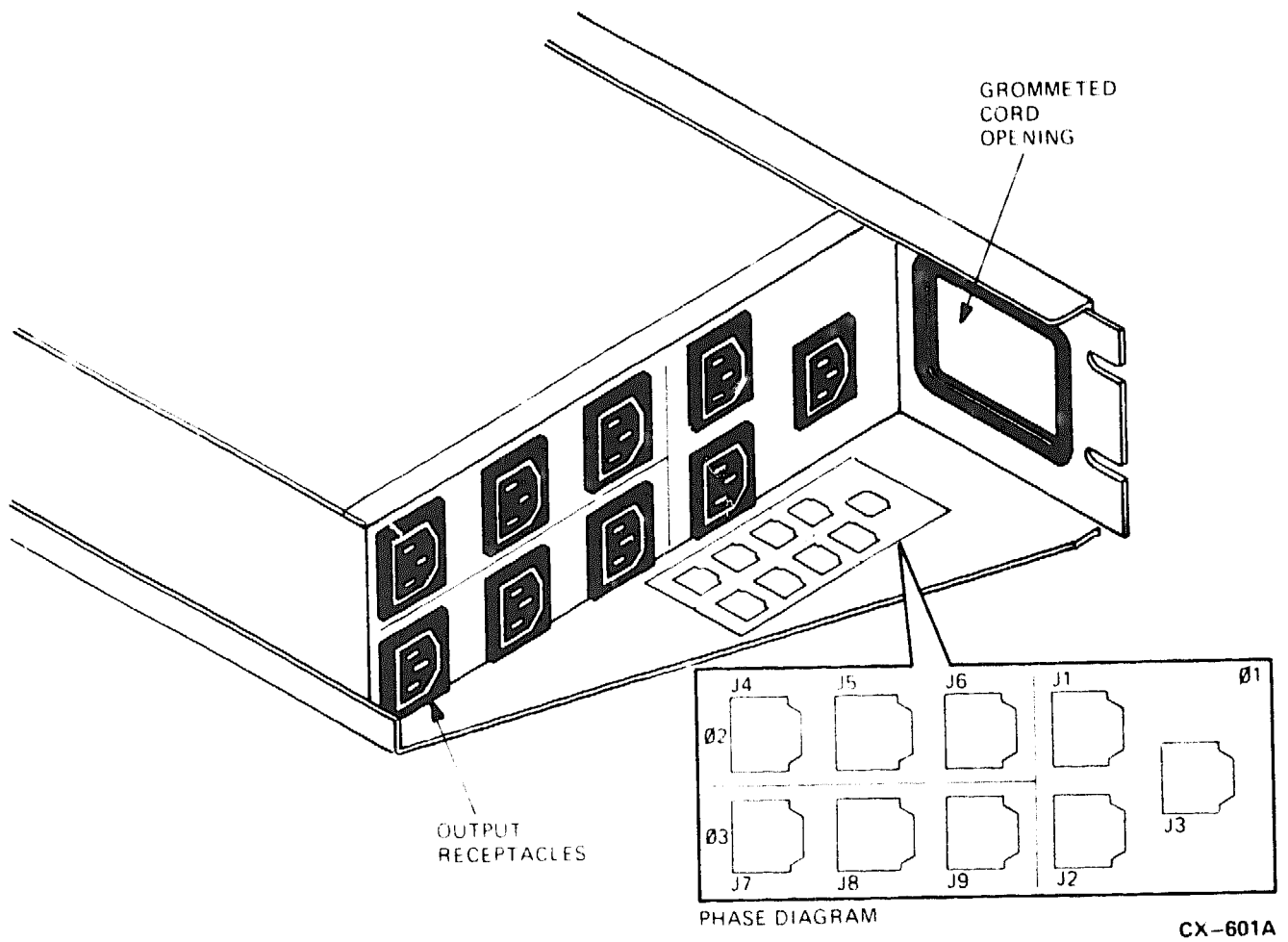
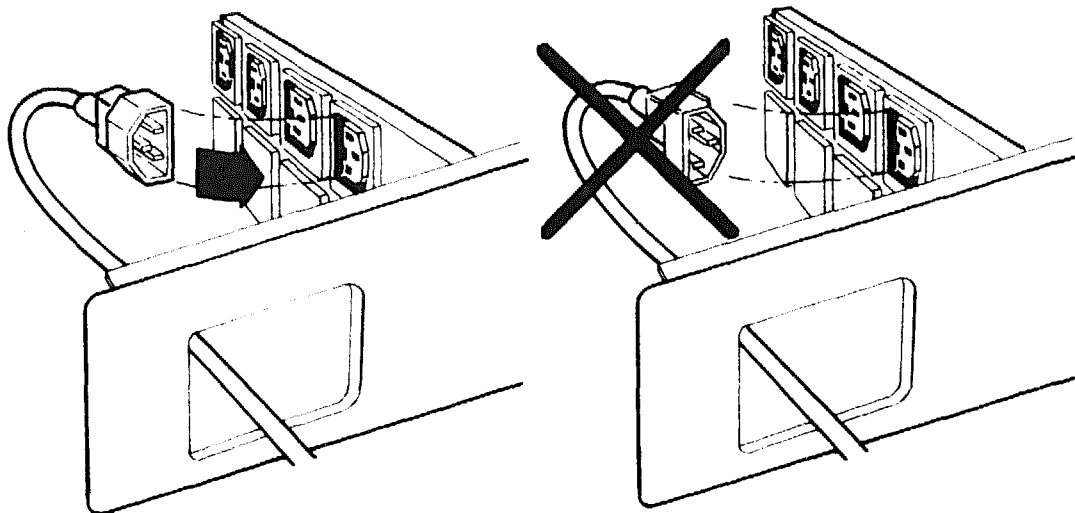


Figure 2-1 AC Output Receptacles



CX-2079A

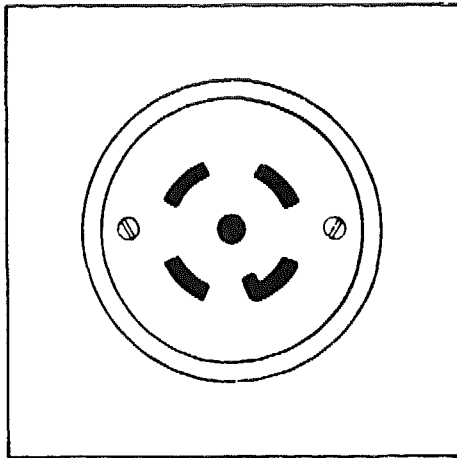
**Figure 2-2 881 Power Controller Rear Output Receptacle**

While the receptacles are identical for both A and B versions, the controller power cord plug comes in one of two types to accommodate ac power distribution requirements. For a list of these requirements, refer to Table 2-1. For the controller power plug designation, refer to Figure 2-3.

**Table 2-1 AC Power Distribution Requirements**

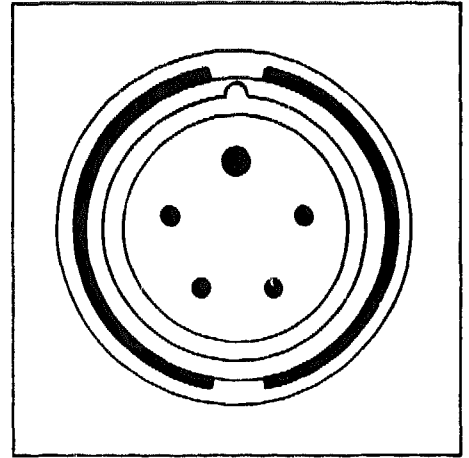
Specifications	881A	881B
Receptacle current rating	30 A	20 A or 16 A
Input voltage	120/208 Vac, three phase WYE	220/380 Vac to 240/415 Vac, three phase WYE
Wire/Connector type	5-wire, NEMA L21-30R type receptacle	5-wire, 4-pole, IEC 309-type receptacle

NEMA L21-30R



USED WITH 881 A POWER CONTROLLER

IEC 309



USED WITH 881 B POWER CONTROLLER

CX-602B

**Figure 2-3 Controller Power Cord Plug Types**

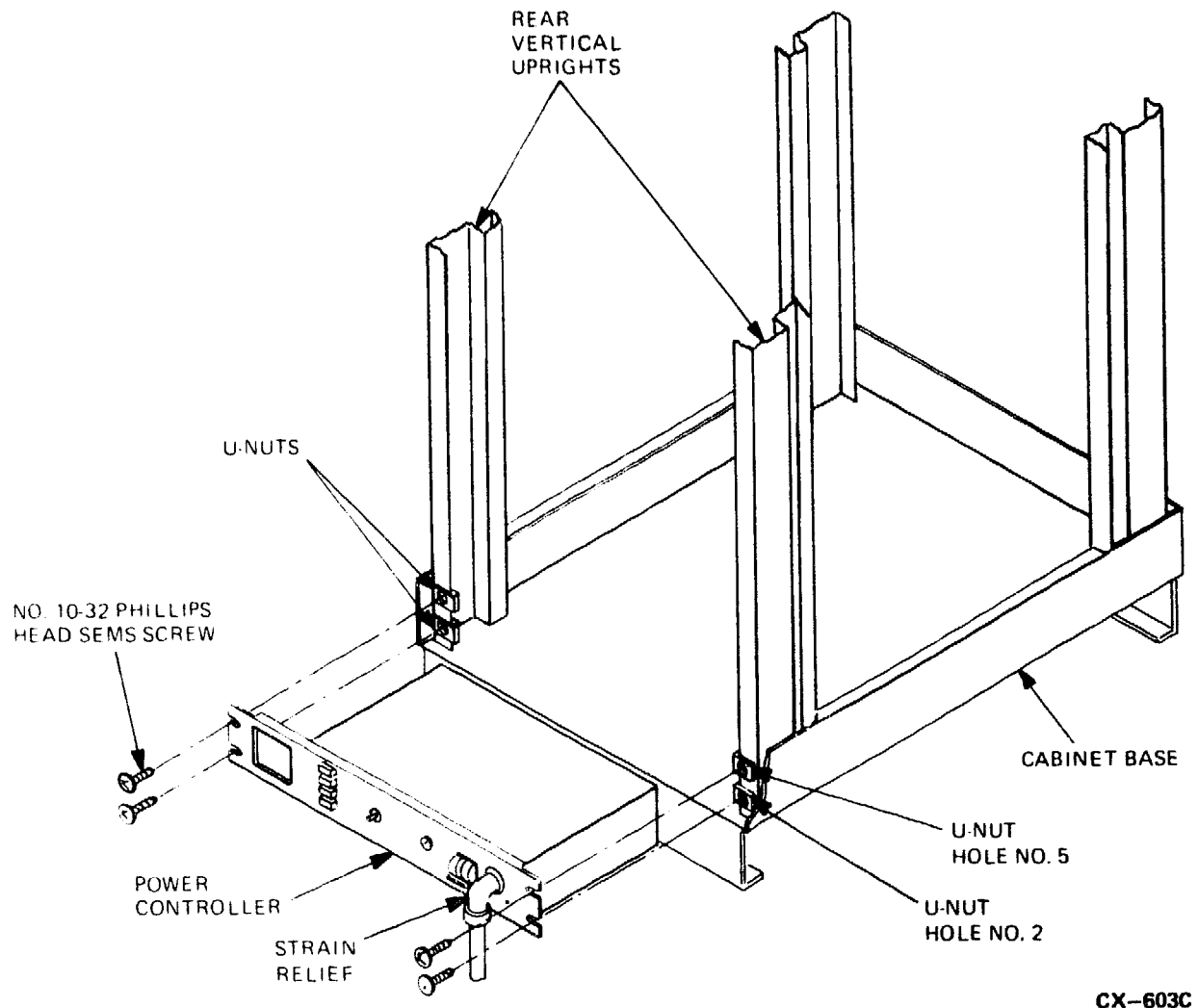
### **CAUTION**

To avoid equipment damage, do not connect the controller power cord to the power distribution system of the building until the procedures in Section 2.3 and Section 2.4 have been completed.

## **2.2 RACK-MOUNTING (881A AND 881B)**

The 881 Power Controller must be the first component mounted into an EIA standard 19-inch cabinet. To install, refer to Figure 2-4 and the following procedure:

1. Install U-nuts at proper hole locations if necessary. (For the DIGITAL H9646-AH/AJ cabinets, use holes number two and five, counting from the base of the rear vertical uprights.)
2. Place the controller between the rear vertical uprights of the cabinet.
3. Align the mounting slots of the controller with the desired hole locations as mentioned earlier.
4. Secure the controller by inserting four 10-32 sems screws through the uprights into the U-nuts.
5. Check to see that the controller is rigidly mounted.



**Figure 2-4 Rack-Mounting Installation**

**NOTE**

**In certain applications, vertical mounting is required. Refer to Figure 2-5.**

Whether the controller is mounted vertically or horizontally, the strain relief must be pointed downward as shown in both figures. If it is not, remove the socket head set screw and rotate the strain relief collar the shortest distance possible until it is positioned over the optional screw hole. Insert and retighten the screw.

## 2.3 LOAD DISTRIBUTION

Install the ac loads to the output receptacles of the power controller (Figure 2-1). Ensure these loads are compatible with the power distribution system as well as the voltage and current ratings of the power controller as stated in the following list:

### CAUTION

**Do not exceed the individual receptacle or phase ratings of the power controller. Refer to Table 1-1.**

- Use 120 Vac loads of less than 15 amps with 881A controllers with 24 amps/phase maximum.
- Use 220-240 Vac loads of less than 10 amps with 881B controllers with 16 amp/phase maximum.

In addition, each load must have a male IEC-type plug of appropriate rating.

When the plugs are connected to the output receptacles, pass each cord through the grommated cord opening shown in Figure 2-1. Connect the plugs in such a way that the load currents are balanced among the three receptacle phases. A phase diagram is marked below the receptacles on the controller chassis and is shown in Figure 2-1. For example, since J1-J3 are wired to phase 1, J4-J6 to phase 2, and J7-J9 to phase 3, you would insert three plugs using receptacles J1, J4 and J7, and stagger any additional plugs accordingly.



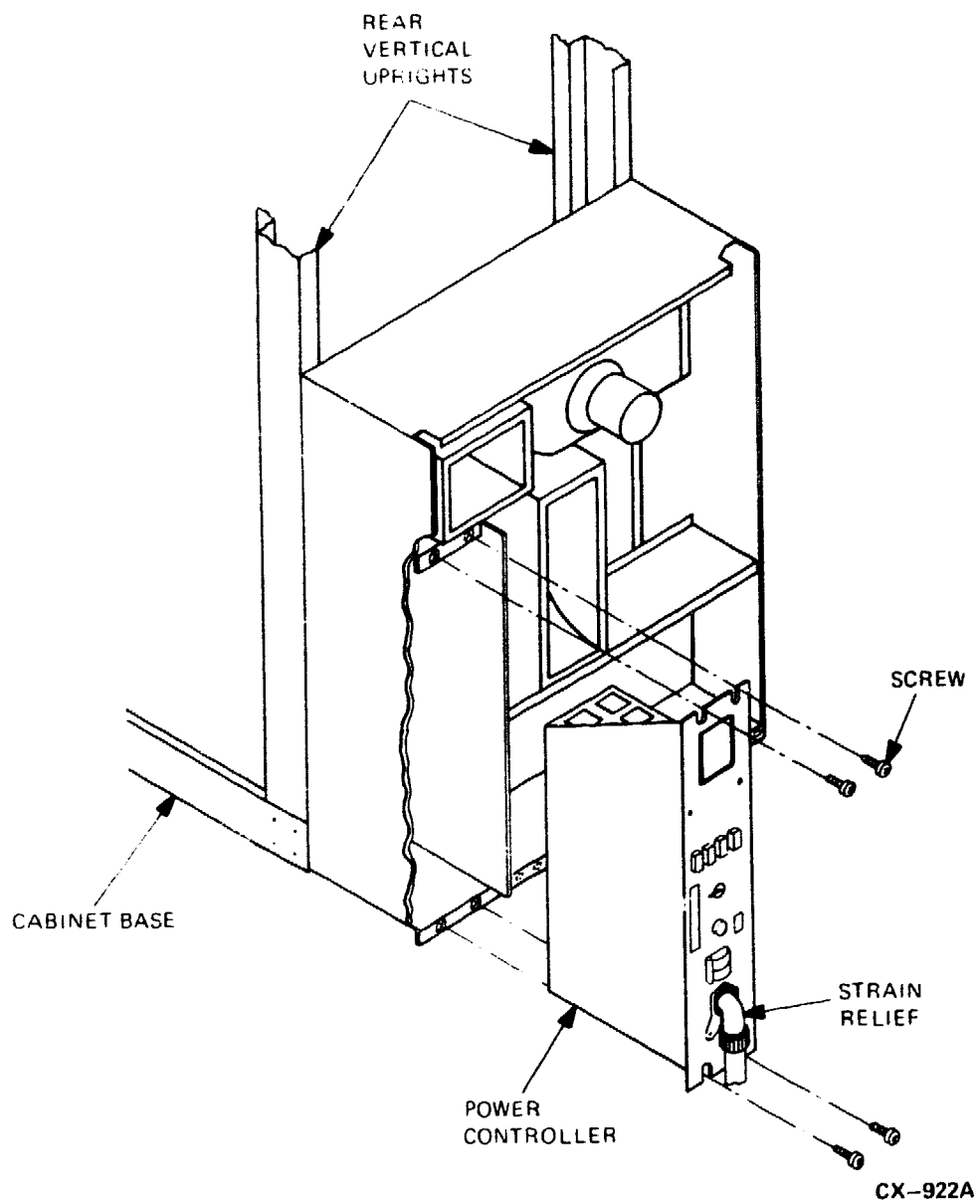
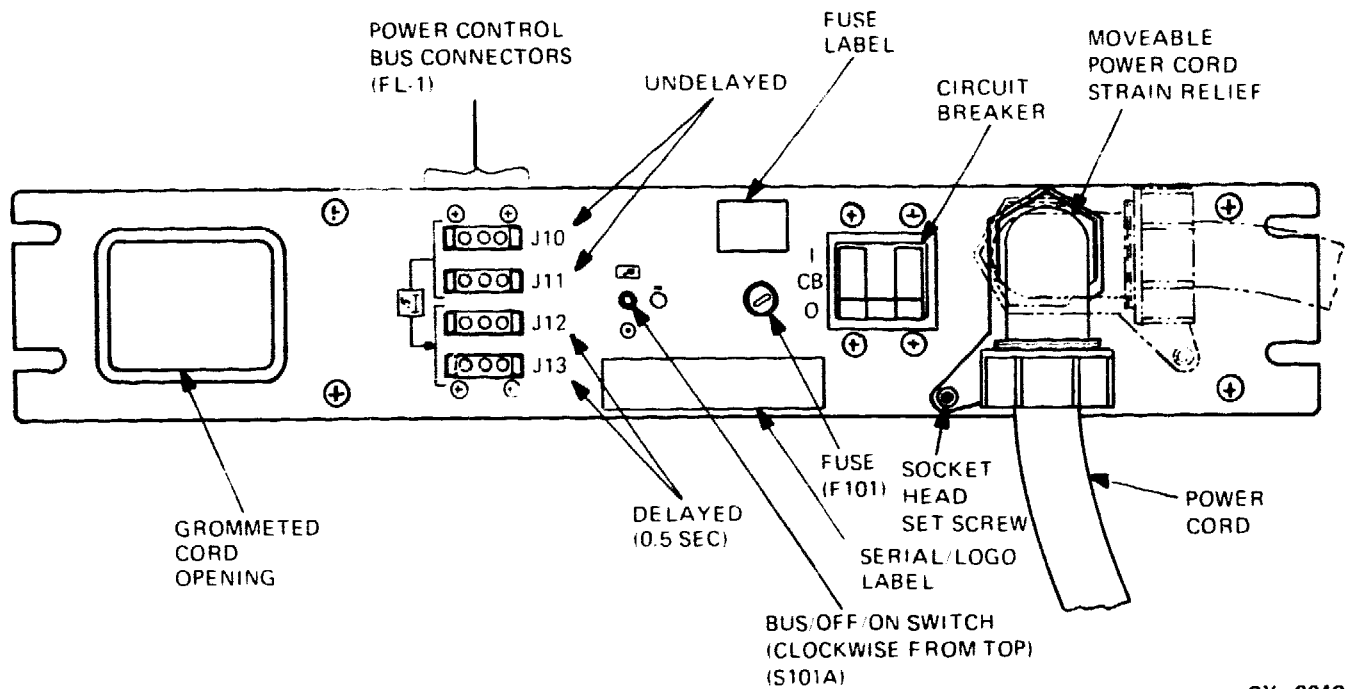


Figure 2-5 Vertical Installation

## 2.4 DIGITAL POWER CONTROL BUS CONNECTIONS

If power connections to another cabinet are required, install DIGITAL power bus cables (DIGITAL part number 7008288-0-0) to the power control bus (J10-J13) on the front panel of the controller (Figure 2-6). Since connectors J10 and J11 are not delayed, and J12 and J13 are delayed in output one-half to two seconds, make the connections according to application requirements.



CX-604C

Figure 2-6 881 Power Controller Front Panel (A and B)

## 2.5 EXTERNAL SENSE CONNECTIONS

If external sense connections to another component are required, insert a two-pin female (socket) MATE-N-LOK connector (DIGITAL part number 12-10821-02 with connector pin sockets A-PS-1209379-0-0) from that component into the mating male connector on the rear of the controller. Refer to Figure 2-7.

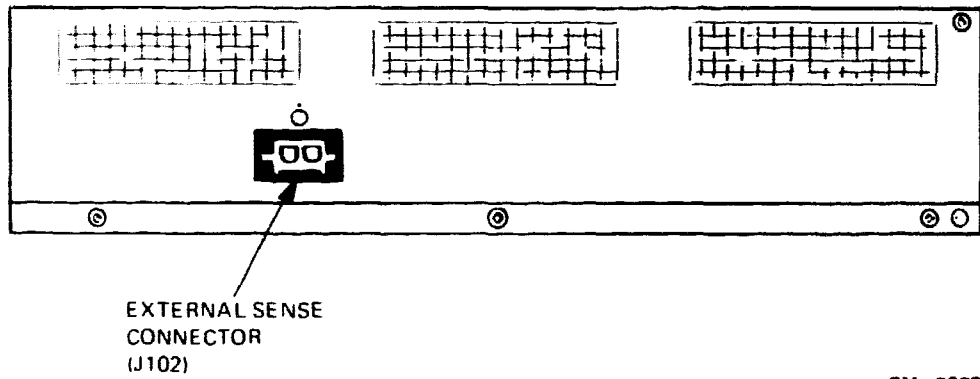


Figure 2-7 881 Power Controller Rear Panel

## 2.6 POWER CONTROLLER CORD PLUG

Insert the controller power cord plug into an appropriately rated (120/208V or 240/416V) receptacle of the building's power distribution system. Read Chapter 3 before applying power.







# 3

## OPERATING INSTRUCTIONS

### 3.1 INTRODUCTION

The two basic controls on the power controller are the circuit breaker and the BUS/OFF/ON switch. These and all but one of the other controls are located on the front panel of the controller (Figure 2-6). Their functions are described in Table 3-1 and in the paragraphs that follow.

**Table 3-1 Controls and Indicators**

Control or Indicator	Function
CB Circuit breaker	Provides overload protection for the nine output receptacles and control circuits.
BUS/OFF/ON switch	Controls ac power to the nine ac outlets and selects remote operation.
 BUS position	Enables remote control of ac power via the DIGITAL power control bus connectors.
 OFF position	Removes ac power from the power controller output receptacles and prevents the power controller from responding to power control bus signals.
 ON position	Applies ac power to ac outlet receptacles. Power control bus REQUEST signal is ignored. Power control bus INHIBIT signal is valid.
 EXTERNAL SENSE connector (2-pin on rear of controller)	Isolates ac power from the output receptacles. The circuit must then be reset for normal operation by cycling the circuit breaker off and then on.
Power control bus (3-pin)	Provides a means of controlling the power state of a system from remote locations. A switch closure between Pins 1 and 3 will supply ac power to the output receptacles. A switch closure between Pins 2 and 3 will isolate ac power.
Sequenced power control bus (3-pin)	Adds a 0.5 to 2.0 second delay to the POWER REQUEST line (pin 1).
Fuse	Protects the ac bus from control circuitry overload.

### 3.1.1 Power Controller Circuit Breaker

The power controller circuit breaker (Figure 2-6) is one means of controlling the ac power to all the outlets on the controller. It also provides overload protection for the ac line loads and is unaffected by switching the BUS/OFF/ON control described in Section 3.1.2.

### 3.1.2 BUS/OFF/ON Switch (S101A)

The three positions of this switch are BUS, OFF, and ON. When the circuit breaker to the power controller is ON, this switch controls the power to the ac outlet in the following ways:

- **BUS position**—Enables remote control of ac power via the DIGITAL power control bus connectors.

The BUS position is intended for remote sensing of DIGITAL power control bus instructions. This position requires the use of a remote sensing cable not shipped with the power controller. If you don't have this cable, or your application does not require the use of the DIGITAL power control bus, leave the switch in the ON position.

- **OFF position**—Removes ac power from the power controller output receptacles and prevents the power controller from responding to power control bus signals.
- **ON position**—Applies ac power to ac outlet receptacles. Power control bus REQUEST signal is ignored. Power control bus INHIBIT signal is valid.

### 3.1.3 Power Control Bus (Front Panel J10, J11)

#### WARNING

Do not rely on the DIGITAL power control bus to isolate hazardous voltages from the system. Use the circuit breaker to isolate all hazardous voltages.

The power control bus both supplies and detects signals in response to sensors and a master switch. Connections to the DIGITAL power control bus are made through the use of DIGITAL power bus cables (DIGITAL Part Number 7008288-0-0). Pin 1 is the POWER REQUEST (requests ac power when the state of Pin 1 is low), Pin 2 is the POWER INHIBIT (inhibits ac power when the state of Pin 2 is low), and Pin 3 is the RETURN (the states of Pin 1 and Pin 2 referenced to Pin 3, not to ground). Use Table 3-2 to determine bus logic:

**Table 3-2 Power Control Bus Truth Table**

(Pin 1)	(Pin 2)	(Switched AC Power)
High	High	OFF
Low	High	ON
High	Low	OFF
Low	Low	OFF

#### NOTE

The number of bus controls attached to the power control bus must not exceed 40.

### 3.1.4 Sequenced Power Control Bus (Front Panel J12, J13)

The sequenced power control bus allows products such as disk cabinets to start sequentially by adding a 0.5 to 2.0 second delay to the POWER REQUEST line (Pin 1). The sequenced circuit receives its logic signal from the power control bus (J10 or J11) and retransmits the delayed signal via another identical connector (J12 or J13). The POWER INHIBIT is paralleled in the connectors so the inhibit function is not lost. In addition, the sequenced power control bus meets all the conditions of the power control bus as described in the preceding section.

#### CAUTION

Implementation of the DIGITAL power control bus or sequenced power control bus permits normal control of the power state of computers and certain peripheral devices. It is not intended to meet the requirements of National Fire Protection Association (NFPA) No. 75-7300 Emergency Power Controls in Computer Rooms. This specification requires an Emergency Power Control Switch near the operator's panel and the room EXIT to disconnect all power to the electronic devices in the room. DIGITAL recommends that the user provide such switches and protective circuitry as part of site preparation.

### 3.1.5 EXTERNAL SENSE Connector (J102)

This two-pin male receptacle (J102) on the back of the power controller attaches to DIGITAL cable connector part number 12-10821-02 with connector pin sockets A-PS-1109379-0-0. It removes power from the loads when enabled by an external sensor. Conditions that a sensor may detect include system overtemperature or system air-flow loss. To engage the EXTERNAL SENSE, plug an appropriate sensor (one that presents a switch closure in the event of an out-of-tolerance condition) into the two pins on the connector. To reset the EXTERNAL SENSE, cycle the circuit breaker off and then back on again.

#### WARNING

Do not rely on the EXTERNAL SENSE control to isolate hazardous voltages from the system. Use the circuit breaker to isolate all hazardous voltages.

## 3.2 POWER APPLICATION

Once the proper use of the controls has been determined and the loads have been attached to the power controller, switch the power controller circuit breaker to the ON position.

## 3.3 TROUBLESHOOTING CHECKLIST

If all prior instructions in this manual have been completed and the system does not function properly, go through the following steps in the order listed:

1. Ensure the controller power cord is plugged in.
2. Ensure the circuit breaker is in the ON position.
3. Ensure the BUS/OFF/ON switch is in the appropriate position:
  - BUS—external control
  - ON—local control
  - OFF—power off
4. Check fuse continuity after removing power from the controller.

### **3-4 OPERATING INSTRUCTIONS**

5. Verify integrity of all cable connections.
6. Verify EXTERNAL SENSE signal is not an INHIBIT signal.
7. Verify the circuit breaker is set.
8. Verify the source signal for the DIGITAL power control bus is not an INHIBIT signal.
9. Verify building ac power distribution.

If the preceding steps do not resolve the problem, contact a qualified service representative.

#### **NOTE**

A schematic of each of the two versions of the 881 Power Controller is provided in Figure 3-1 and Figure 3-2. They are provided for use by qualified service personnel only.



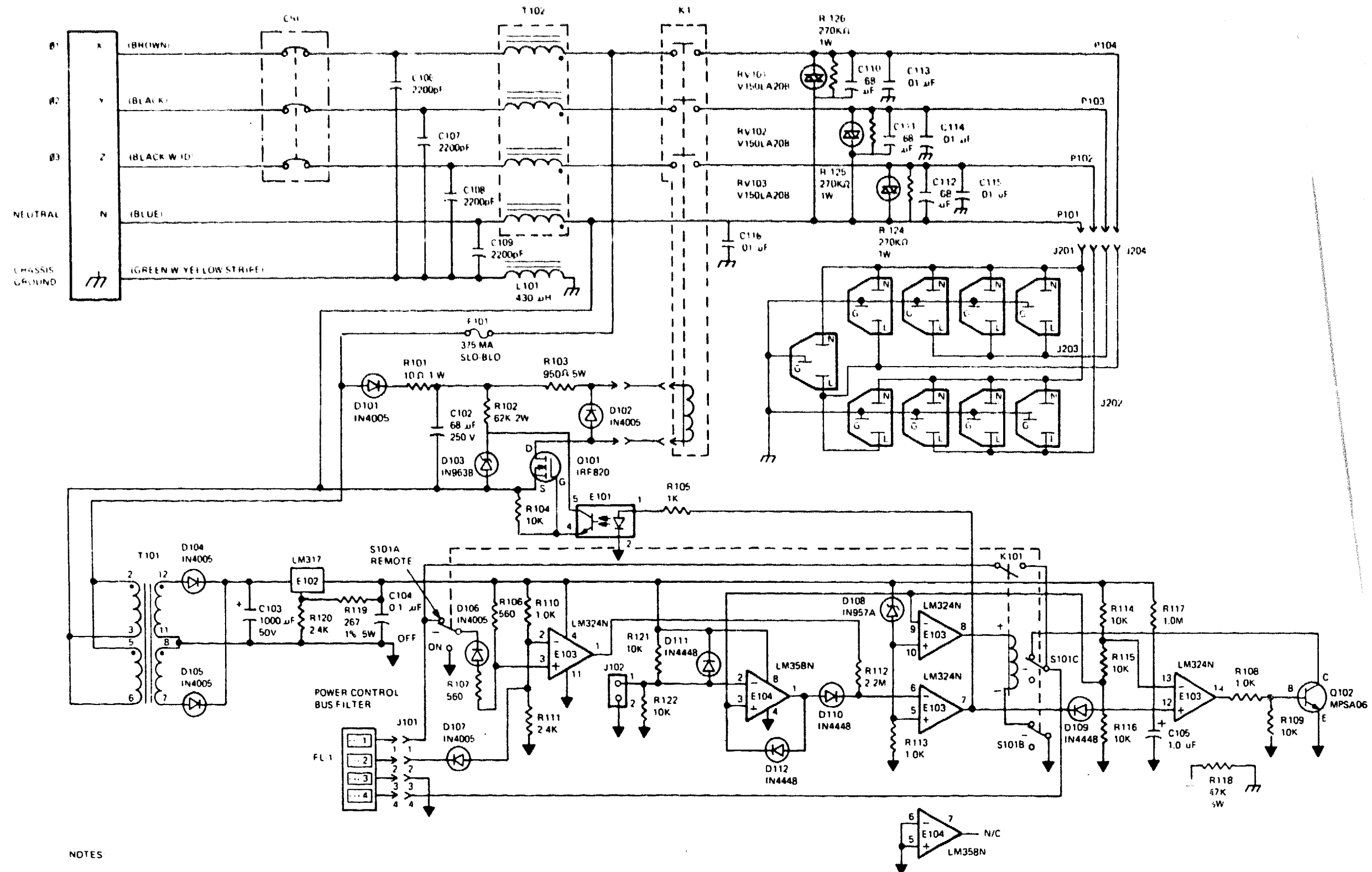
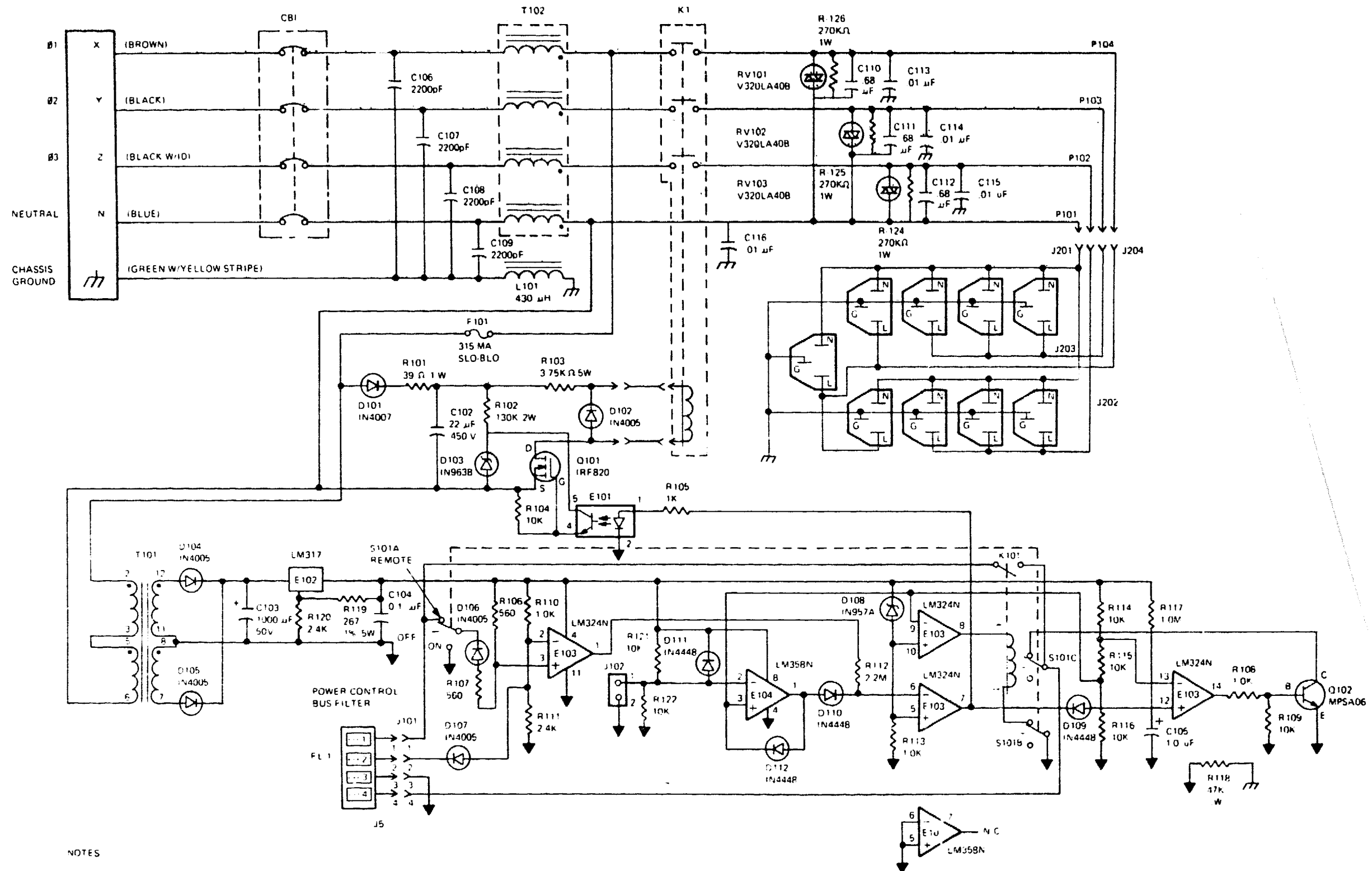


Figure 3-1 Schematic (Version A)

### 3-6 OPERATING INSTRUCTIONS



- NOTES
1. CB1 SHOWN IN ON POSITION
  2. SWITCH S101 SHOWN IN REMOTE POSITION
  3. RELAY K1 SHOWN DE-ENERGIZED
  4. RELAY K101 SHOWN ENERGIZED

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**CX-926B**

**Figure 3-2 Schematic (Version B)**



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